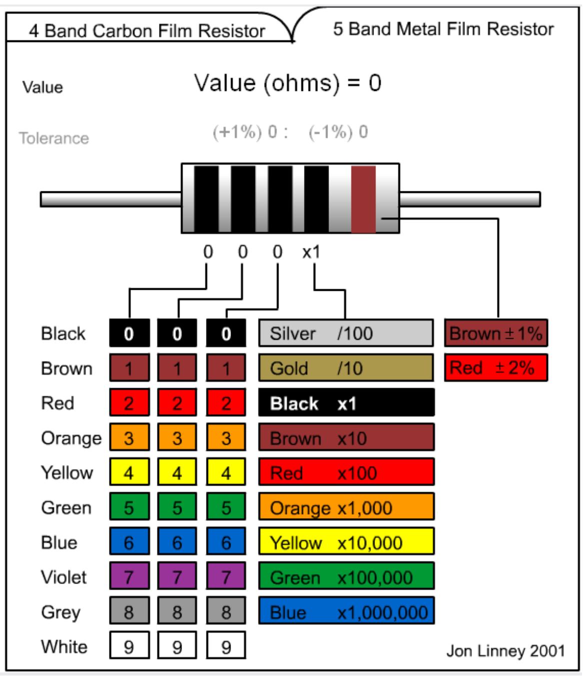
TRƯỜNG ĐẠI HỌC KINH TẾ- KỸ THUẬT BÌNH DƯƠNG
KHOA ĐIỆN- ĐIỆN TỬ

BÀI GIẢNG
ANH VĂN CHUYÊN NGÀNH ĐIỆN- ĐIỆN TỬ



BIÊN SOẠN: NGUYỄN TƯỜNG DŨNG

Tỉnh Bình Dương, năm 2018

MỤC LỤC

PART 1. THE ELECTRIC MOTOR

1. **Vocabulary- ANIMATION**
2. **Tuning – in (WATCH VIDEO)**

Task 1

Working in your group, list as many items as you can in the home which use electric motors. Which room has the most items?

3. Reading Skimming

In Unit 1 you studied scanning – locating specific information quickly. Another useful strategy is reading a text quickly to get a general idea of the kind of information it contains. You can then decide later, depending on your reading purpose. This strategy is called skimming.

Task 2

Skim this text and identify the paragraphs which contain information on each of these topics. The first one has been done for you.

a. What electric motors are used for
b. The commutator
c. Why the armature turns
d. Electromagnets
e. Effect of putting magnets together
f. The armature

a. Paragraph 1
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In an electric motor an electric current and magnetic field produce a turning movement. This can drive all sorts of machines, from wrist-watches to trains. The motor shown in Fig.1 is for a washing machine. It is a universal motor, which can run on direct current or alternating current.

(Paragraph 1)

An electric current running through a wire produces a magnetic field around the wire. If an electric current flows around a loop of wire with a bar of iron through it, the iron becomes magnetized. It is called an electromagnet; one end becomes a north pole and the other a south pole, depending on which way the current is flowing around the loop.

(Paragraph 2)

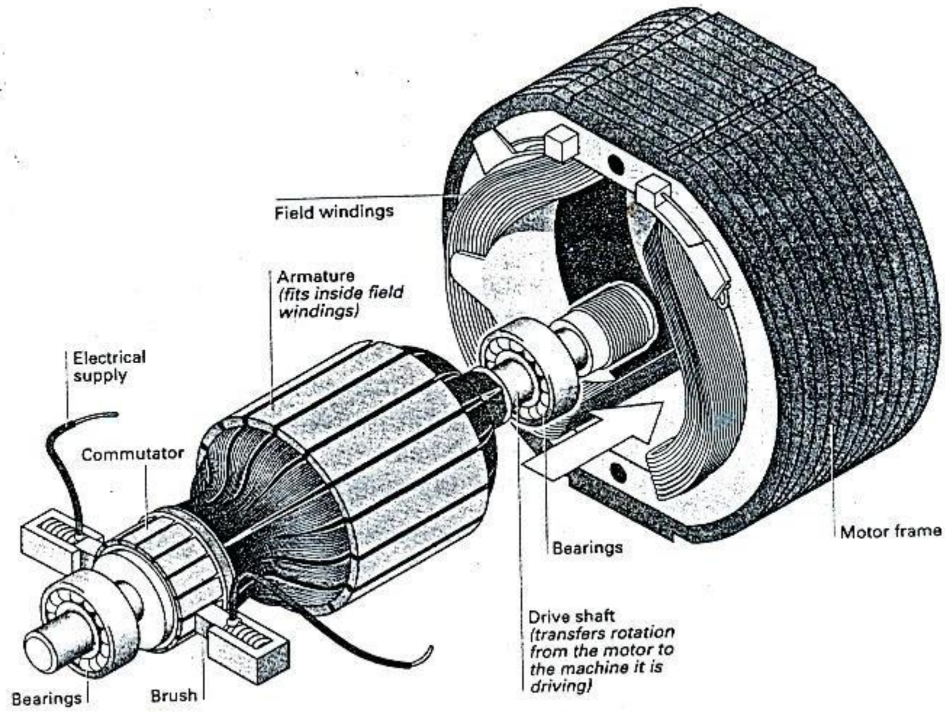


Fig. 1. The DC electric motor

If you put two magnets close together, like poles – for example, two north poles – repel each other, and unlike poles attract each other.

(Paragraph 3)

In a simple electric motor, like the one shown in Fig.2 a piece of iron with loops of wire round it, called an armature, is placed between the north and south poles of a stationary magnet, known as the field magnet. When electricity flows around the armature wire, the iron becomes an electromagnet.

(Paragraph 4)

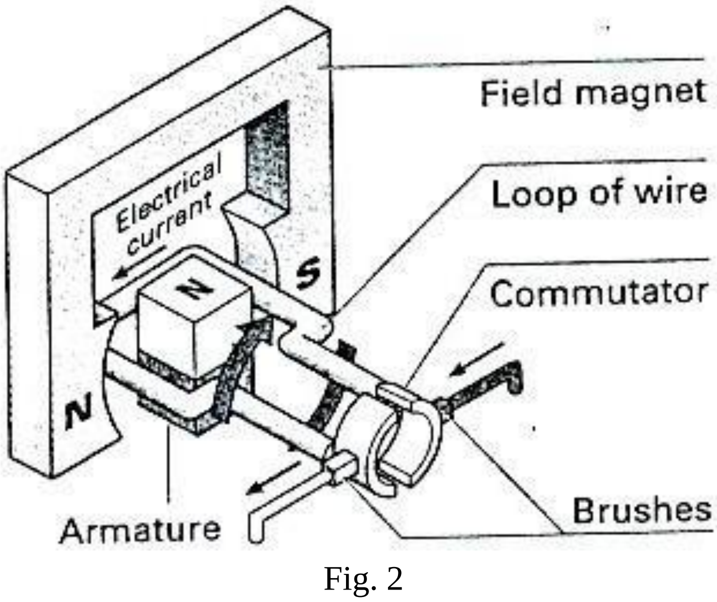


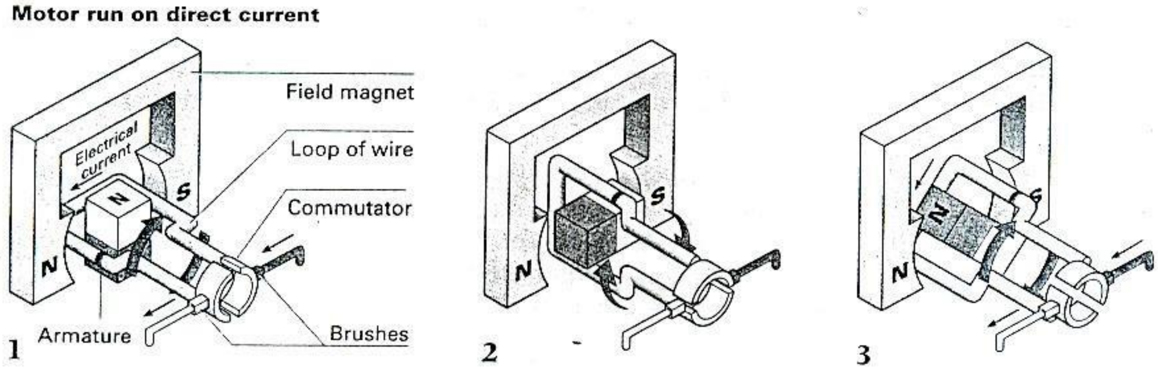
Fig. 2

The attraction and repulsion between the poles of this armature magnet and the poles of the field magnet make the armature turn. As a result, its north pole is close to the north pole of the armature. Then the current is reversed so the north pole of the armature magnet becomes the south pole. Once again, the attraction and repulsion between it and the field magnet make it turn. The armature continues turning as long as the direction of the current, and therefore its magnetic poles, keeps being reversed. *(Paragraph 5)*

To reverse the direction of the current, the ends of the armature wire are connected to different halves of a split ring called a commutator. Current flows to and from the commutator through small carbon blocks called brushes. As the armature turns, first one half of the commutator comes into contact with the brush delivering the current, and then the other, so the direction of the current keeps being reversed. *(Paragraph 6)*

Task 3

Match each of these diagrams with the correct description, A, B, C or D. One of the descriptions does not match any of the diagrams. (The diagrams are in the correct sequence, but the description are not.)



A

The armature turns a quarter of a turn. Then electric contact is broken because of the gap in the commutator, but the armature keeps turning because there is nothing to stop it.

B

When current flows, the armature becomes an electromagnet. Its north pole is attracted by the south pole and repelled by the north pole of the field magnet.

C

When a universal motor is run on direct current, the magnetic poles in the armature change while those of the field magnet remain constant.

D

When the commutator comes back into contact with the brushes, current flows through the armature in the opposite direction. Its poles are reversed and the turn continues.

4.* Language study *Describing function

Try to answer this question:

- What does an electric motor do?

When we answer a question like this, we describe the function of something. We can describe the function of an electric motor in this way:

- An electric motor converts electrical energy to mechanical energy.

We can emphasize the function like this:

- The function of an electric motor is to convert electrical energy to mechanical energy.

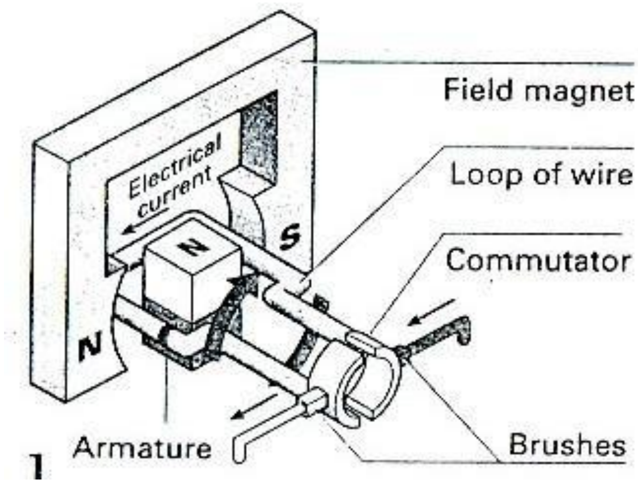
Task 4

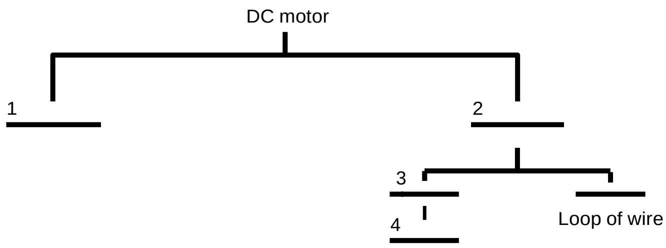
Match each of these motor components to its function, and then describe its function in a sentence.

Component		**Function**	
1	armature	**a**	transfers rotation from the motor
2	bearings	**b**	create an electromagnetic field
3	brushes	**c**	converts electromagnetic energy to rotation
4	commutator	**d**	reverses the current to the armature
5	drive shaft	**e**	support the drive shaft
6	field windings	**f**	supply current to the armature

5. Writing *Describing components*

Task 5. Dismantle this simple dc motor into its components by completing the labelling of the chart below.





Now study this description of the motor.

A simple dc motor consists of a field magnet and an armature. The armature is placed between the poles of the magnet. The armature is made up of a loop of wire and a split ring known as a commutator. The loop is connected to the commutator. Current is supplied to the motor through carbon blocks called brushes.

To write a description, you need to use language to:

1. Dismantle a piece of equipment into its main parts. These expressions will help:

	consists of	X
AA	is made up of	X and Y
	is composed of	Y

2. Name components:

	known as	
Carbon blocks	called	brushes

3. Locate components:

- The armature is placed between the poles.

4. Connect components:

- The loop is connected to the commutator.

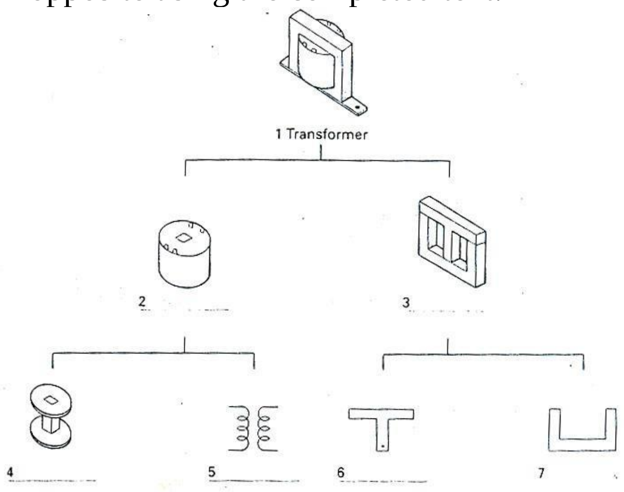
Task 6 [WATCH VIDEO]

Complete the text with the help of the diagram on the next page. Use the following words:

- are made up
- is placed
- is composed
- consists

A transformer ………of two coils, a primary and a secondary. The coils are wound on a former which is mounted on a core. The coil……………..of a number of loops of wire. The core……….of thin pieces of soft iron. U – and T- shaped pieces are used. The former ....on the leg of the T.

Now label the diagram opposite using the completed text.



6. Word study

Study these expression for describing how components are connected to each other.

A is bolted to B. = A is connected to B with bolts.

A is welded to B. = A is connected to B by welding.

A is fixed to B. = no specific method given.

Task 7. Explain each of these methods of connection.

1 screwed
2 soldered
3 attached
4 wired
5 bonded
6 glued
7 riveted
8 welded
9 brazed
10 nailed

7. Exercise 1: Tranlate into Vietnamese

CONDUCTORS, INSULATORS, SEMI-CONDUCTORS

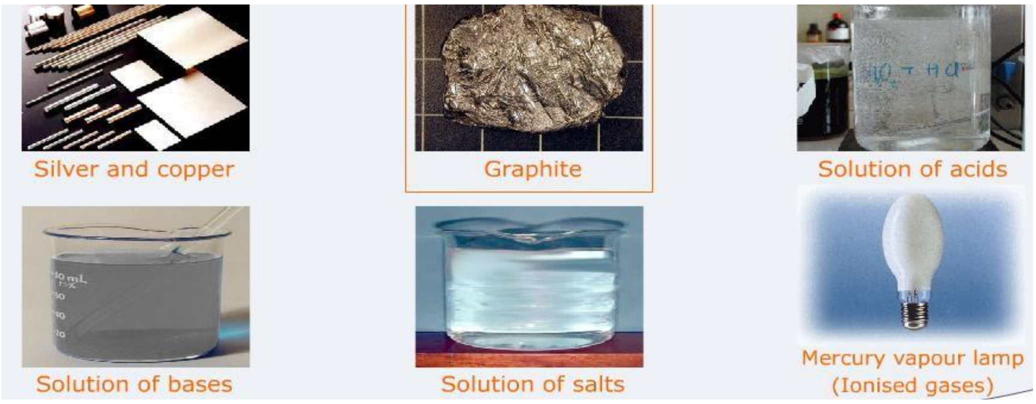
- WATCH ANIMATION

Materials are classified to 3 types:

- Conductors; Insulators; Semi-conductors

1. Conductors:

Materials that allow electric charges to flow through them are known as electrical conductors.



- For example: silver and copper, solution of acids, solution of bases, solution of salts, mercury vapour lamp (ionised gases)

2. Insulators:

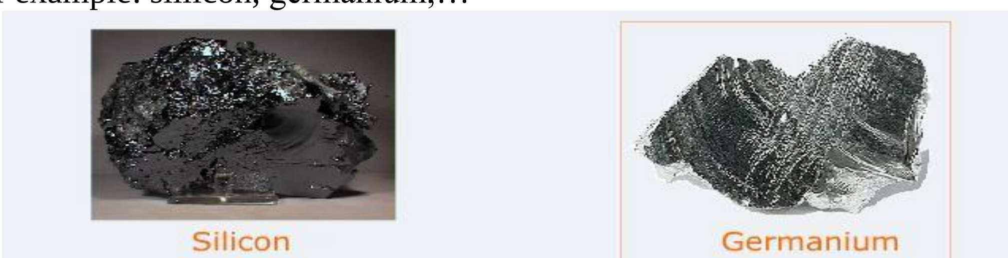
Materials that not allow electric charges to flow through them are known as non-conductors or electrical insulator.

- For example: rubber, glass, plastics, dry wood, diamond,…

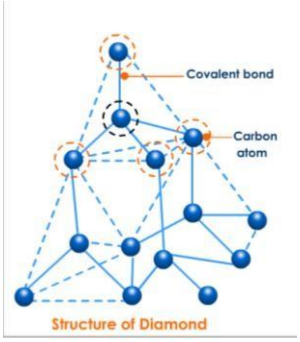
3. Semi-conductors:

Materials whose conductivity is less than that of the conductors and greater than that of the insulator are known as semiconductors.

- For example: sillicon, germanium,…

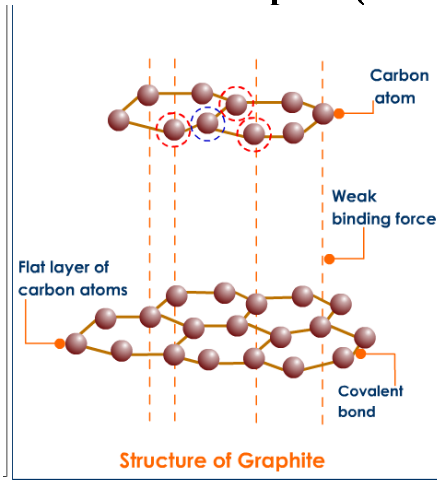


- **Structure of diamond:**



This is structure of diamond. Pure carbon, it's combined of one carbon atom with four another nearly. On the four valence electrons are used in bond formation.
Therefore, diamond is insulator all electricity.

- Structure of Graphite (the core of pencils contains graphite):



One valence electron in bond formation . This three electron is available for conduction. Every atom is bond with three another atom, created two-dimensional grids of flat layer of carbon atom, these one are weakly bond together.

- Semi-conductor like germinium and silicon, can be made to conductor eletricity by impurities. It likes berylium and boron.

8. Exercise 2: Listening and Speaking Skill

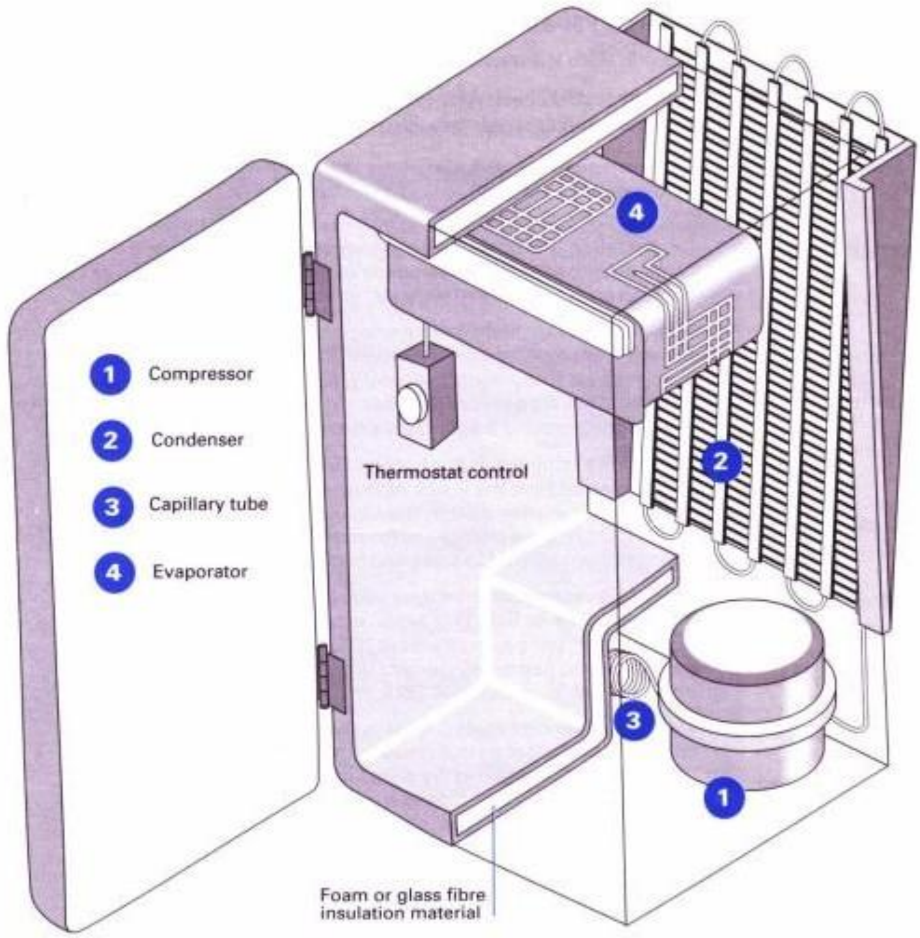
- Student choose at least 1 from 15 topic in PART 5 to practice listening and speaking skill

PART 2. REFRIGERATOR

1. Tuning- in (ANIMATION)

Task 1

Study this diagram. It explains how a refrigerator works. In your group try to work out the function of the numbered components using the information in the diagram.



2. Reading *Dealing with unfamiliar words*

You are going to read a text about refrigerator. Your purpose is to find out how they operate. Read the first paragraph of the text below. Underline any words which are unfamiliar to you.

Refrigeration preserves food by lowering its temperature. It slows down the growth and reproduction of micro-organisms such as bacteria and the action of enzymes which cause food to rot.

You may have underlined words like *micro-organisms*, *bacteria*, or *enzymes*. These are words which are uncommon in engineering. Before you look them up in a dictionary or try to find translations in your own language, think! Do you need to know the meaning of these words to understand how refrigerators operate?

You can ignore unfamiliar words which do not help you to achieve your reading purpose.

Task 2

Now read the text to check your explanation of how a refrigerator works.

Ignore any unfamiliar words which will not help you to achieve this purpose.

Fridge

Refrigeration preserves food by lowering its temperature. It slows down the growth and reproduction of micro-organisms such as bacteria and the action of enzymes which cause food to rot.

Paragraph 1

Refrigeration is based on three principles. Firstly, if a liquid is heated, it changes to a gas or vapour. When this gas is cooled, it changes back into a liquid. Secondly, if a gas is allowed to expand, it cools down. If a gas is compressed, it heats up. Thirdly, lowering the pressure around a liquid helps it to boil.

Paragraph 2

To keep the refrigerator at a constant low temperature, heat must be transferred from the inside of the cabinet to the outside. A refrigerant is used to do this. It is circulated around the fridge, where it undergoes changes in pressure and temperature and changes from a liquid to a gas and back again.

Paragraph 3

One common refrigerant is a compound of carbon, chlorine, and fluorine known as R12. This has a very low boiling point: - 29^0C. At normal room temperature (about 20^0C) the liquid quickly turns into gas. However, newer refrigerants which are less harmful to the environment, such as KLEA 134a, are gradually replacing R12.

Paragraph 4

The refrigeration process begins in the compressor. This compresses the gas so that it heats up. It then pumps the gas into a condenser, a long tube in the shape of a zigzag. As the warm gas passes through the condenser, it heats the surroundings and cools down. By the time it leaves the condenser, it has condensed back into a liquid.

Paragraph 5

Liquid leaving the condenser has to flow down a very narrow tube (a capillary tube). This prevents liquid from leaving the condenser too quickly, and keeps it at a high pressure.

Paragraph 6

As the liquid passes from the narrow capillary tube to the larger tubes of the evaporator, the pressure quickly drops. The liquid turns to vapour, which expands and cools. The cold vapour absorbs heat from the fridge. It is then sucked back into the compressor and the process begins again.

Paragraph 7

The compressor is switched on and off by a thermostat, a device that regulates temperature, so that the food is not over- frozen.

Paragraph 8

3. **Language study *Principles and laws***

Study these extracts from the text above. What kind of statements are they?

1) If a liquid is heated, it changes to a gas or vapour.
2) If a gas is allowed to expand, it cools down.
3) If a gas is compressed, it heats up.

Each consists of an action followed by a result. For example:

Action	**Result**
A liquid is heated	it changes to a gas or vapour

These statements are principles. They describe things in science and engineering which are always true. The action always followed by the same result.

Principles have this form:

If/When (action – present tense), (result- present tense).

Task 3

Link each action in column A with a result from column B to describe an important engineering principle.

A - Action	**B - Result**
1. a liquid is heated	a. it heats up
2. a gas is cooled	b. there is an equal and opposite reaction
3. a gas expands	c. it changes to a gas
4. a gas is compressed	d. it extends in proportion to the force
5. a force is applied to a body	e. it is transmitted equally throughout the fluid
6. a current passes through a wire	f. a current is induced in the wire
7. a wire cuts a magnetic field	g. it cools down
8. pressure is applied to the surface of an enclosed fluid	h. it sets up a magnetic field around the wire
9. a force is applied to a spring fixed at one end	i. it changes to a liquid

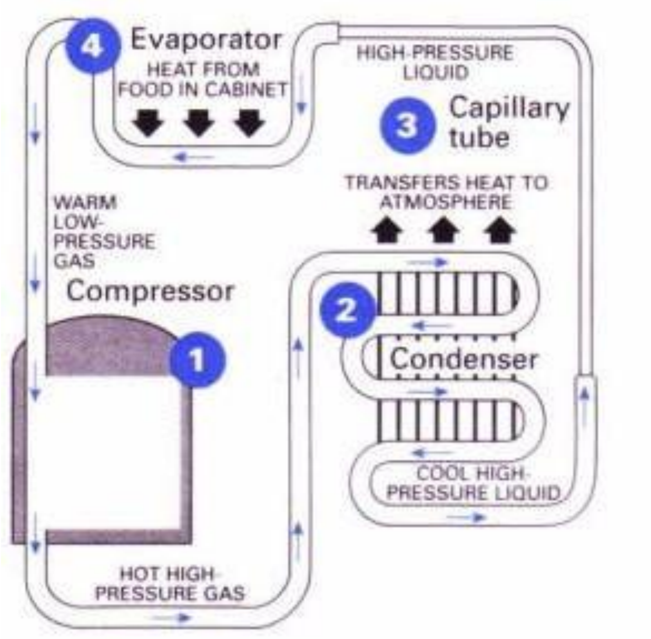
4. Word study *Verbs and related nouns*

Task 4. Each of the verbs in column. A has a related noun ending in –er or –or in column B. Complete the blanks. You have studied these words in this and earlier units. Use a dictionary to check any spellings which you are not certain about.

A Verbs	**B Nouns**
For example:	
Refrigerate	refrigerator
A	**B**
a. condense	
b.	evaporator
c. compress	
d. resist	
e.	charger
f. generate	
g. conduct	
h.	exchanger
i. radiate	
j. control	

5. Writing *Describing a process, 2: location*

Study this diagram. It describes the refrigeration process.



In unit 2 we learnt that when we write about a process, we have to:

1. Sequence the stages
2. Locate the stages
3. Describe what happens at each stage
4. Explain what happens at each stage

For example

Sequence location *Description explanation*

- The refrigeration process begins in the compressor. This compresses the gas so that it heats up.

In this unit we will study ways to locate the stages.

Task 5

Put these stages in the refrigeration process in the correct sequence with the help of the diagram above. The first one has been done for you.

a. The liquid enters the evaporator.	---------------------
b. The gas condenses back into a liquid.	----------------------
c. The vapour is sucked back into the compressor.	----------------------
d. The gas is compressed.	1
e. The liquid turns into a vapour.	---------------------
f. The gas passes through the condenser.	----------------------
g. The liquid passes through a capillary tube.	----------------------
h. The high pressure is maintained.	----------------------

These are two ways to locate a stage in a process.

1. Using a preposition + noun phrase. For example:

- The liquid turns to vapour in the evaporator.
- The gas cools down in the condenser

2. Using a where – clause, a relative clause with where rather than which or who, to link a stage, its location, and what happens there. For example:

- The warm gas passes through the condenser, where it heats the surrounding and cools down.

- The refrigerant circulates around the fridge, where it undergoes changes in pressure and temperature.

Task 6. Complete each of these statements.

1. The gas passes through the compressor, where------------------
2. It passes through the condenser, where----------------------------
3. The liquid passes through a capillary tube, where ---------------
4. The liquid enters the evaporator, where--------------------------
5. The cold vapour is sucked back into the compressor, where--

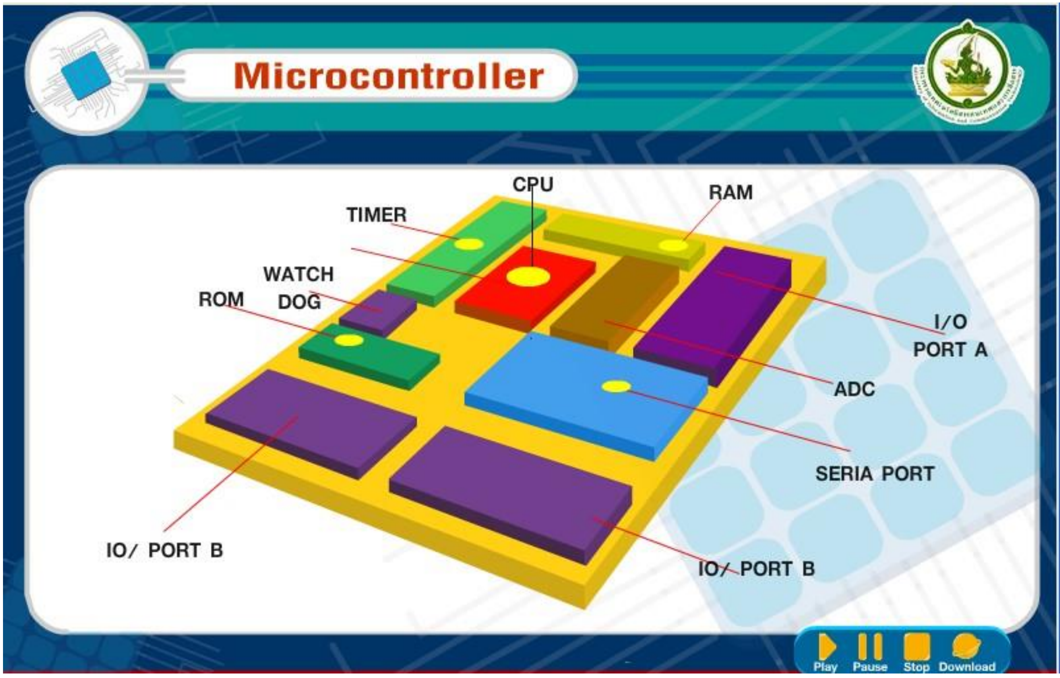
Task 7. Add sequence expressions to your statements to show the correct order of events. For example:

- First the gas passes through the condenser…

Make your statements into a paragraph adding extra information from the text in Task 2 if you wish. Then compare your paragraph with paragraphs 6, 7, and 8 from the text.

6. **Exercise 1: Translate into Vietnamese (WATCH VIDEO)**

HOW A MICROCONTROLLER WORKS



A microcontroller is a computer. All computers -- whether we are talking about a personal desktop computer or a large mainframe computer or a microcontroller -- have several things in common:

All computers have a CPU (central processing unit) that executes programs. If you are sitting at a desktop computer right now reading this article, the CPU in that machine is executing a program that implements the Web browser that is displaying this page.

The CPU loads the program from somewhere. On your desktop machine, the browser program is loaded from the hard disk.

The computer has some RAM (random-access memory) where it can store "variables."

And the computer has some input and output devices so it can talk to people. On your desktop machine, the keyboard and mouse are input devices and the monitor and printer are output devices. A hard disk is an I/O device -- it handles both input and output.

The desktop computer you are using is a "general purpose computer" that can run any of thousands of programs. Microcontrollers are "special purpose computers." Microcontrollers do one thing well. There are a number of other common characteristics that define microcontrollers. If a computer matches a majority of these characteristics, then you can call it a "microcontroller":

Microcontrollers are "**embedded**" inside some other device (often a consumer product) so that they can control the features or actions of the product. Another name for a microcontroller, therefore, is "embedded controller."

Microcontrollers are **dedicated** to one task and run one specific program. The program is stored in ROM (read-only memory) and generally does not change.

Microcontrollers are often **low-power devices**. A desktop computer is almost always plugged into a wall socket and might consume 50 watts of electricity. A battery-operated microcontroller might consume 50 milliwatts.

A microcontroller has a **dedicated input device** and often (but not always) has a small **LED or LCD display for output**. A microcontroller also takes input from the device it is controlling and controls the device by sending signals to different components in the device.

For example, the microcontroller inside a TV takes input from the remote control and displays output on the TV screen. The controller controls the channel selector, the speaker system and certain adjustments on the picture tube electronics such as tint and brightness. The engine controller in a car takes input from sensors such as the oxygen and knock sensors and controls things like fuel mix and spark plug timing. A microwave oven controller takes input from a keypad, displays output on an LCD display and controls a relay that turns the microwave generator on and off.

A microcontroller is often **small and low cost**. The components are chosen to minimize size and to be as inexpensive as possible.

A microcontroller is often, but not always, **ruggedized** in some way.

The microcontroller controlling a car's engine, for example, has to work in temperature extremes that a normal computer generally cannot handle. A car's microcontroller in Alaska has to work fine in -30 degree F (-34 C) weather, while the same microcontroller in Nevada might be operating at 120 degrees F (49 C). When you add the heat naturally generated by the engine, the temperature can go as high as 150 or 180 degrees F (65-80 C) in the engine compartment.

On the other hand, a microcontroller embedded inside a VCR hasn't been ruggedized at all.

The actual **processor** used to implement a microcontroller can vary widely. For example, the cell phone shown on Inside a Digital Cell Phone contains a Z-80 processor. The Z-80 is an 8-bit microprocessor developed in the 1970s and originally used in home computers of the time. The Garmin GPS shown in How GPS Receivers

Work contains a low-power version of the Intel 80386, I am told. The 80386 was originally used in desktop computers.

In many products, such as microwave ovens, the demand on the CPU is fairly low and price is an important consideration. In these cases, manufacturers turn to **dedicated microcontroller chips --** chips that were originally designed to be low-cost, small, low-power, embedded CPUs. The Motorola 6811 and Intel 8051 are both good examples of such chips. There is also a line of popular controllers called "PIC microcontrollers" created by a company called Microchip. By today's standards, these CPUs are incredibly minimalistic; but they are extremely inexpensive when purchased in large quantities and can often meet the needs of a device's designer with just one chip.

7. Exercise 2: Listening and Speaking Skill

- Student choose at least 1 from 15 topic in PART 5 to practice listening and speaking skill

PART 3. PORTABLE GENERATOR

1. Tuning- in (WATCH VIDEO)

Task 1

List the different ways in which electricity can be generated

2.* Reading. *Reading diagrams

Task 2

Study the diagram below of a portable generator. Answer these questions using the diagram and your own knowledge of engineering.

1. What are its main parts?
2. What does the engine run on?
3. What are the four strokes called?
4. What is the function of the crankshaft?
5. What do both stator and rotor have?
6. What is the difference between stator and rotor?

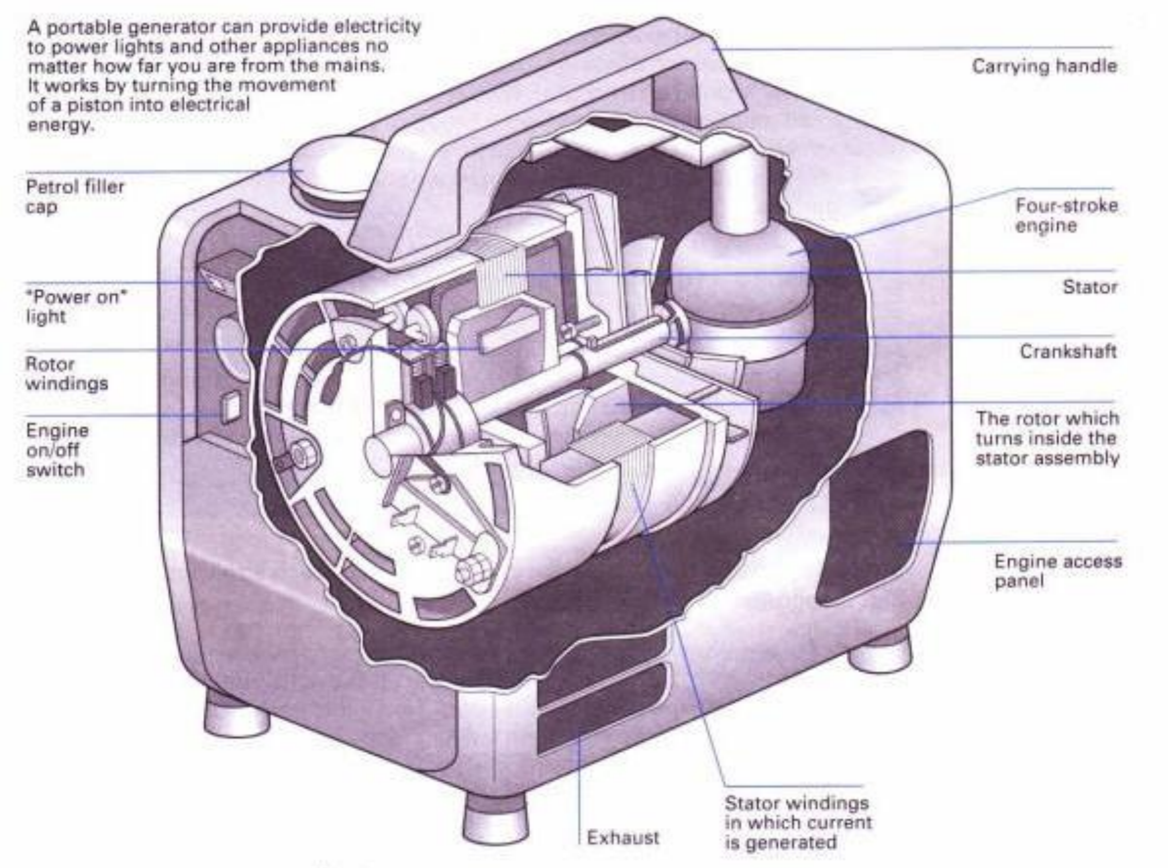


Fig. 1

Task 3 Read text to check as many of the answers as you can. You will not find complete answers to all of the questions.

Portable Generator

Although most electricity comes from power stations, power can also be generated by far smaller means. Nowadays, electricity generator can be small enough to be held in the hand.

Portable generators are made up of two main parts: an engine, which powers the equipment, and an alternator, which converts motion into electricity.

The engine shown (Fig.1) runs on petrol. It is started by pulling a cord. This creates a spark inside which ignites the fuel mixture.

In a typical four- stroke engine, when the piston descends, the air inlet valve opens and a mixture of air and petrol is sucked in through a carburettor.
The valve closes, the piston rises on the compression stroke and a spark within the upper chamber ignites the mixture. This mini-explosion pushes the piston back down, and as it rises again the fumes formed by the ignition are forced out through the exhaust valve.
This cycle is repeated many times per second. The moving piston makes the crankshaft rotate at great speed.
The crankshaft extends directly to an alternator, which consists of two main sets of windings- coil of insulated copper wire wound closely around an iron core. One set, called stator windings, is in a fixed position and shaped like a broad ring. The other set, the armature windings, is wound on the rotor which is fixed to the rotating crankshaft. The rotor makes about 3,000 revolutions per minute.
The rotor is magnetized and as it spins round, electricity is generated in the stator windings through the process of electromagnetic induction. The electric current is fed to the output terminals or sockets.
This type of generator can produce a 700 watt output, enough to operate lights, television, and some domestic appliances. Larger versions provide emergency power to hospital and factories.

Task 4

Study this text on the four- stroke cycle. Then label each stroke correctly in Fig. 2 opposite.
In the four – stroke cycle, the piston descends on the intake stroke, during which the inlet valve is open. The piston ascends on the compression stroke with both valves closed and ignition takes place at the top of the stroke. The power or expansion stroke follows. The gas generated by the burning fuel expands rapidly, driving the piston down, both valves remaining closed. The cycle is completed by the exhaust stroke, as the piston ascends once more, forcing the products of combustion out through the exhaust valve. The cycle then repeats itself.

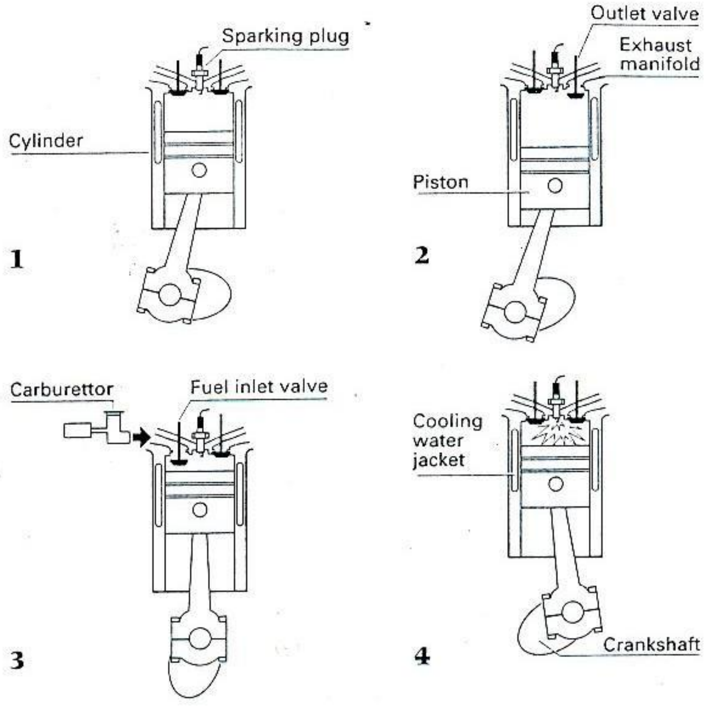


Fig. 2

3. Language study Cause and effect, 2

Study these pairs of actions. What is the link between each pair?

1. The gas expands.
2. This drives the piston down.
3. The piston ascends.
4. This forces the products of combustion out.

These are two links between the actions:

They happen at the same time. We can show this using **as**.

- 1+2: As the gas expands, it drives the piston down.
- 3+4: As the piston ascends, it forces the products of combustion out.

One is a cause and the other an effect.

1. Cause: The gas expands.
2. Effect: This drives the piston down.
3. Cause: The piston ascends.
4. Effect: This forces the products of combustion out.

We can show both the time link and the cause and effect link like this:

- 1+2: The gas expands, driving the piston down.
- 3+4: The piston ascends, forcing the products of combustion out.

Task 5

Link this action in the same way.

Cause	Effect
1. The piston moves down the cylinder.	This creates a partial vacuum
2. The piston creates a vacuum.	This draws in fuel from the carburettor.
3. The piston moves up the cylinder.	This compresses the mixture.
4. The gas expands quickly.	This pushes the piston down
5. The piston moves up and down	This rotates the crankshaft.
6. The crankshaft spins round	This turns the rotor at 3,000 rpm
7. The armature of the alternator rotates	This induces a current in the stator windings.
8. The alternator runs at a steady 3,000 rpm	This generates around 700 watts.

4. Word study. *Verbs with –ize/-ise*

Study this statement:

- The rotor is magnetized.

What does it mean? Can you say it another way? We can rewrite this statement as:

- The rotor is made magnetic.

Verbs ending in –ize/-ise have a range of meanings with the general sense of **make** + adjective.

Task 6

Rewrite these sentences replacing the phrases in the italics with appropriate –ize/-ise verbs.

1. Some cars are fitted with a security device which makes the engine immobile.
2. In areas where the power supply fluctuates, for sensitive equipment a device to make the voltage stable is required.
3. Manufactures seek to keep costs to a minimum and profits to a maximum.
4. Most companies have installed computers to control their production line.

5. Companies may make their operation more rational by reducing the variety of products they make.

5. Writing *Describing a process, 3: sequence and location*

Task 7- WATCH ANIMATION

Fig.3 opposite shows the distribution of power from power station to consumer. The statements which follow describe the distribution. Put the statements in the correct order with the help of the diagram. The first one has been done for you.

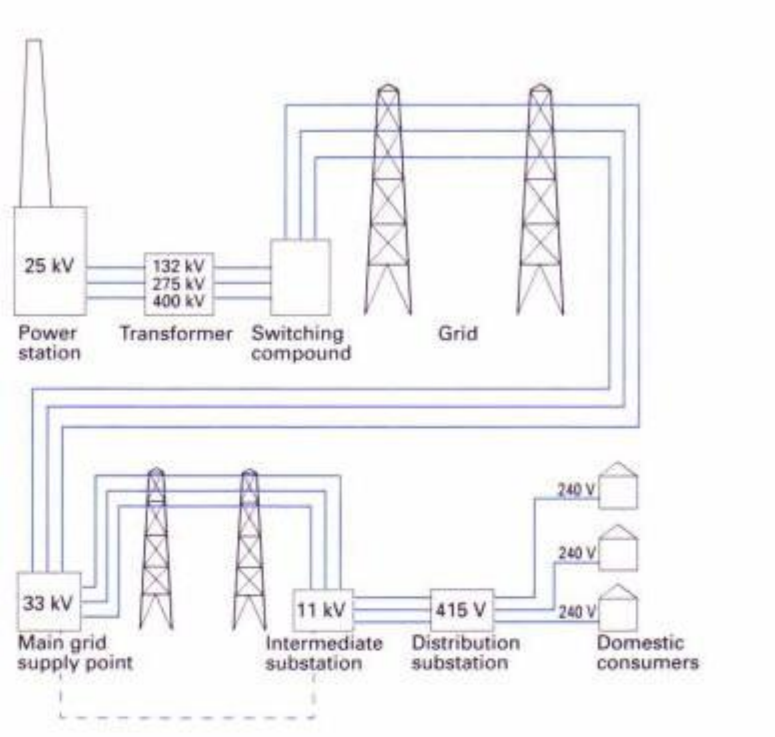


Fig. 3

a. It is fed to distribution substations.

b. It is stepped up by a transformer to high voltage for long-distance distribution.

c. It is distributed via the grid to supply points.

d. It is distributed to the domestic consumer.

e. Electricity is generated at the power station at 25kV. 1

f. It passes via the switching compound to the grid.

g. It is distributed via overhead or underground cables to intermediate substations.

Task 8

Mark the sequence of stages using appropriate sequence words where you think this is helpful: Add the following information to your statements and make them into a text.

1. At the main grid supply point, power is stepped down to 33 kV for distribution to heavy industry.
2. At intermediate substation, power is reduced to 11kV for light industry.
3. At the distribution substations, power is stepped down to 415V, 3-phase, and 240V, 1-phase.

***6.* Technical reading**

Task 9 : *Wave power*

The two following texts describe two plants for generating electricity from wave power. Note the similarities and differences between the plants.

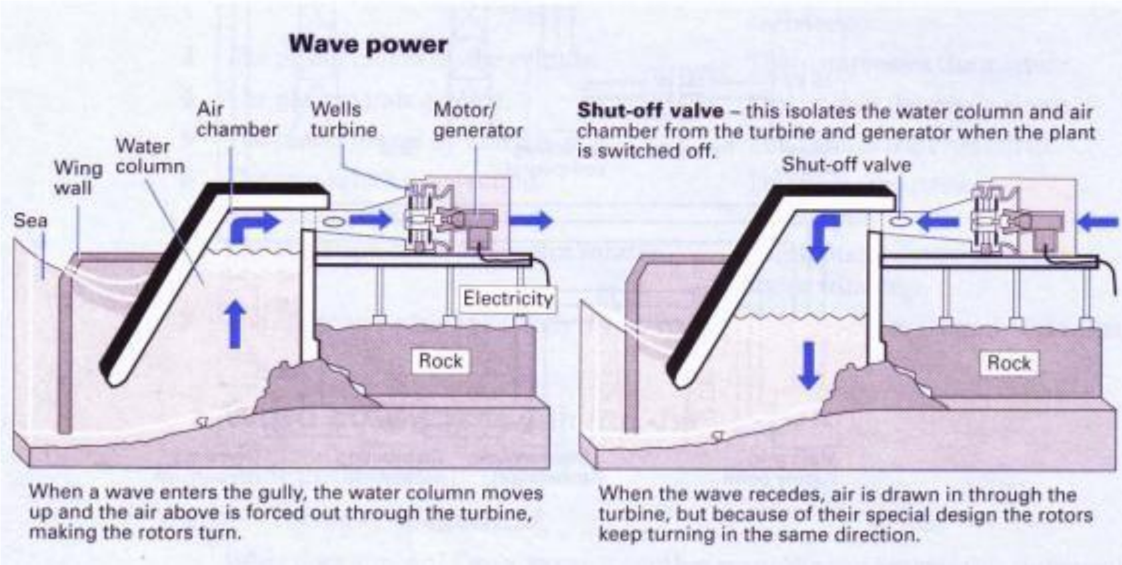


Fig. 4

Wave power

This prototype wave-power plant on the Scottish island of Islay was constructed by building a concrete water column across a natural gully on the shoreline. Waves flowing in and out of the gully cause water in the column to move up and down. As the water moves up it compresses the air above and forces it through a wide tube at the back of the water column. As the water moves down, air is drawn into the water column.

The moving air passes through a turbine coupled to a generator. Both the turbine and generator are unusual. The turbine is a Wells turbine (named after its inventor) which keeps turning in one direction even though the air flow is constantly changing direction. It has two rotors, each with four blades.

The generator is a wound rotor induction motor, which acts as a generator when it is turning at speeds greater than 1,500rpm. Below that speed it operator as a motor and takes power from the grid. This motor/generator is used because the turbine takes some time to build up to a speed where it can generate electricity. When the turbine slows down due to a lull in wave activity, the generator becomes an electric motor and keeps the turbine running at a minimum speed so that it is ready to accept the power from the next batch of waves.

The plant is controlled by a computer. It includes a PLC (programmable logic controller), which monitors the operation of the motor/generator and the amount of electricity going to or being taken from the grid. There is also testing equipment to monitor how much electricity the plant is producing and the efficiency of the water column, turbine, and generator.

This experimental plant generates 150kW. Plans have been approved for the construction of a 1MW scheme.

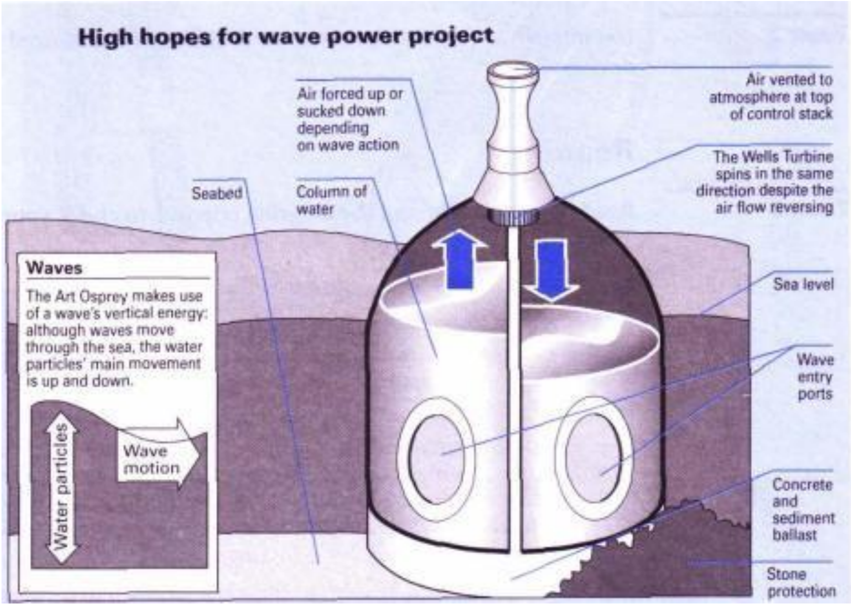


Fig. 5

The world's first power station in the open sea is to be stationed off Dounreay in Scotland. The machine, called Osprey (Ocean Swell-Powered Renewable Energy), will stand in 18 metres of water a kilometre out and not only harvest the larger waves, which produce higher outputs, but also gain power with waves from any direction.

The device is known as an oscillating water column. As a wave rises, air is pushed through an air turbine and sucked back again as the wave falls. The turbine has been designed by Professor Alan Well, of Queen's University, Belfast. It will generate 2 megawatts.

There is potential for 300 Ospreys in Scottish waters which could provide 10 per cent of the country's peak electricity demand.

Task 10: *How electricity is generated*

[1] Fuel (coal, oil or natural gas) is burned in a large [2] boiler, and the walls of the boiler are made up of tubes that carry purified [3] water.

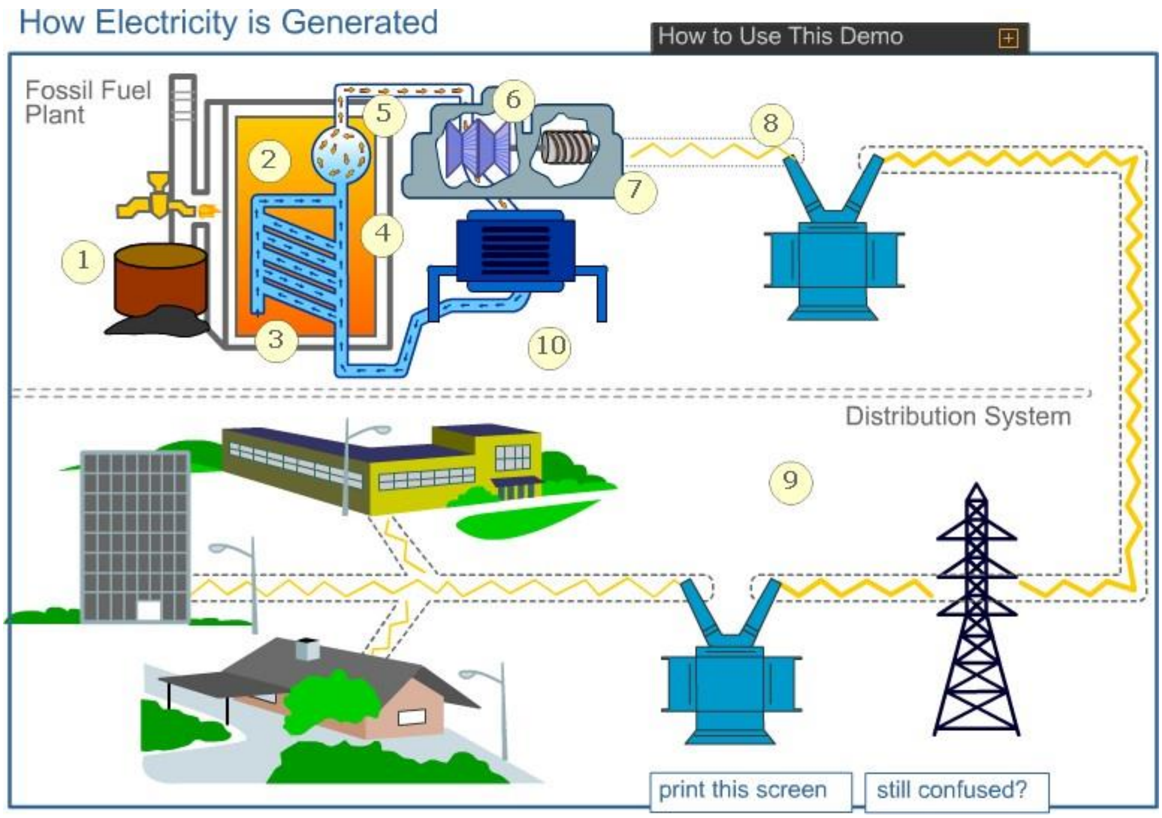
The fuel gives up its chemical heat energy to the tube metal of the boiler. The heat travels by conduction through the walls and is absorbed by the water.

The water temperature increases until it is finally transformed into [4] steam. The steam, now under considerable pressure and at a very high temperature, is piped to a [5] turbine. Where the mechanical energy is produced. The steam strikes the blades of the turbine and spins them, revolving the turbine shaft.

The spinning shaft is connected to the [6] rotor, a large electromagnet. A wire coil called the [7] stator surrounds the rotor. As the rotor revolves within the stator, a flow of electrons, or [8] electricity is produced.

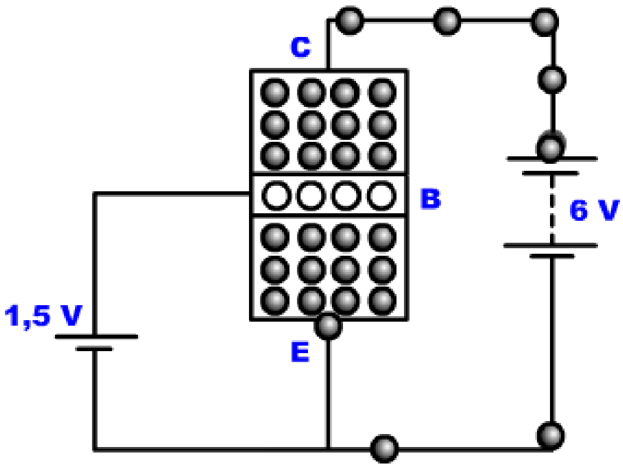
The electricity is then collected at a predetermined voltage and frequency and distributed to you via an elaborate [9] transmission and distribution system. After the steam passes through the turbine, it is led into a steam [10] condenser.

The hot steam is condensed back into water and returned to the boiler to begin the cycle again.

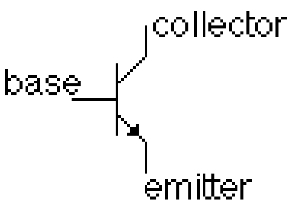


7. Exercise 1: Translate into Vietnamese (WATCH ANIMATION)

HOW DOES A TRANSISTOR WORK



The design of a transistor allows it to function as an amplifier or a switch. This is accomplished by using a small amount of electricity to control a gate on a much larger supply of electricity, much like turning a valve to control a supply of water.



Transistors are composed of three parts – a base, a collector, and an emitter. The base is the gate controller device for the larger electrical supply. The collector is the larger electrical supply, and the emitter is the outlet for that supply. By sending varying levels of current from the base, the amount of current flowing through the gate from the collector may be regulated. In this way, a very small amount of current may be used to control a large amount of current, as in an amplifier. The same process is used to create the binary code for the digital processors but in this case a voltage threshold of five volts is needed to open the collector gate. In this way, the transistor is being used as a switch with a binary function: five volts – ON, less than five volts – OFF.

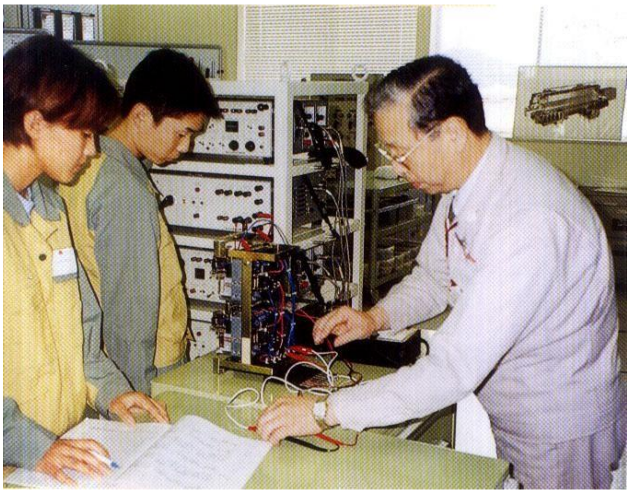
Typical transistor packages

Semi-conductive materials are what make the transistor possible. Most people are familiar with electrically conductive and non-conductive materials. Metals are typically thought of as being conductive. Materials such as wood, plastics, glass and ceramics are non-conductive, or insulators. In the late 1940's a team of scientists working at Bell Labs in New Jersey, discovered how to take certain types of crystals and use them as electronic control devices by exploiting their semi-conductive properties. Most non-metallic crystalline structures would typically be considered insulators. But by forcing crystals of germanium or silicon to grow with impurities such as boron or phosphorus, the crystals gain entirely different electrical conductive properties. By sandwiching this material between two conductive plates (the emitter and the collector), a transistor is made. By applying current to the semi-conductive material (base), electrons gather until an effectual conduit is formed allowing electricity to pass The scientists that were responsible for the invention of the transistor were John Bardeen, Walter Brattain, and William Shockley. Their Patent was called: "Three Electrode Circuit Element Utilizing Semiconductive Materials."

8. Exercise 2: Listening and Speaking Skill

- Student choose at least 1 from 15 topic in PART 5 to practice listening and speaking skill

PART 4. CAREERS IN ENGINEERING (WATCH VIDEO)



1. Tuning - in

Task 1

List some of the jobs in engineering. Combine your list with others in your group

Task 2

Work in group of three A, B, and C. Scan your section of this text, A, B, or C. How many of the jobs in the combined list you made in Task 1 are mentioned in your section?

2. Jobs in engineering

A

Professional engineers may work as:

Design engineers: They work as part of a team to create new products and extend the life of old products by updating them and finding new applications for them. Their aim is to build quality and reliability into the design and to introduce new components and material to make the product cheaper, lighter, or stronger.

Installation engineers: They work on the customer's premises to install equipment produced by their company.

Production engineers: They ensure that the production process is efficient, that materials are handled safely and correctly, and that faults which occur in production are corrected. The design and development departments consult with them to ensure that any innovations proposed are practicable and cost-effective.

B

Just below the professional engineers are the *technician engineers*. They require a detailed knowledge of a particular technology-electrical, mechanical, electronic, etc. They may lead team of engineering technicians. Technician engineers and engineering technicians may work as:

Test/Laboratory technicians: They test samples of the materials and of the product to ensure quality is maintained.

Installation and service technicians: They ensure that equipment sold by the company is installed correctly and carry out preventative maintenance and essential repairs.

Production planning and control technicians: They produce the manufacturing instructions and organize the work of production so that it can be done as quickly, cheaply, and efficiently as possible.

Inspection technicians: They check and ensure that incoming and outgoing components and products meet specifications.

Debug technicians: They fault find, repair, and test equipment and products down to component level.

Draughtsmen /women and designers: They produce the drawings and design documents from which the product is manufactured.

C

The next grades are craftsmen/women. Their work is highly skilled and practical. Craftsmen and women may work as:

Toolmakers: They make dies and moulding tools which are used to punch and form metal components and produce plastic components such as car bumpers.

Fitters: They assemble components into larger products.

Maintenance fitters: They repair machinery.

Welders: They do specialized joining, fabricating, and repair work.

Electricians: they wire and install electrical equipment.

Operators require fewer skills. Many operator jobs consist mainly of minding a machine, especially now that more and more processes are automated. However, some operators may have to check components produced by their machines to ensure they are accurate. They may require training in the use of instruments such as micrometers, verniers…

Task 3

Combine answers with the others in your group. How many of the jobs listed in Task 1 are mentioned in the whole text?

Task 4

Who would be employed to:

1. test completed motors from a production line?
2. find out why a new electronics assembly does not work?
3. produce a mould for a car body part?
4. see that the correct test equipment is available on a production line?
5. find a cheaper way of manufacturing a crankshaft?
6. repair heating systems installed by their company?
7. see that a new product is safe to use?
8. commission a turbine in a power?

3. **Reading *Inferring from samples***

In Task 5 below and in the Listening (Task 7), you are asked to infer from a small sample of text information which is not clearly started. Use the clues in the samples and the knowledge you have gained from the text Jobs in engineering.

Task 5

As a group, try to identify the jobs these workers from their statements.

We perform standard chemical and physical tests on samples, usually as a result of a complaint from inspectors on the production line. We are an important part of production. We have the authority to stop the line if we find something seriously wrong. It is interesting work, and we’re able to move around from test and chat. Sometimes, admittedly, the work gets a bit repetitive.

All machinists can be difficult. The older blokes especially don’t like me telling them their work is not good enough and instructing them to do it again. One or two of them seem to think the inspector is always out to get them. I am constantly having to calm things down.

We measure up the components to see that they are the right size and shape, and we make any minor adjustments ourselves with hand tools or power tools. All along, parts

will need adjusting slightly and you have to check things at each stage with measuring instruments and gauges. You have to get a feel for it-clearances have to be just right. Otherwise things won't fit together.
I find my job a very satisfying one. It's never easy to say exactly why one likes a job. I think the basic thing I get out of my profession at the moment is the creativity that is involved in design work. You start from square one with a plain sheet of paper. You draw a component. You design something and perhaps a few moths later you can see the end product. And you gat told whether or not your design works! I think it's that aspect that I find most satisfying.
I enjoy my job. I really enjoy doing the same thing every day-exactly the same job. You know what to look for and how things should be. You know how the machine-or the machines-run, when a machine is working properly and when there is something wrong with it. I really like the routine. I don't have dreams of becoming a supervisor or anything like that. I'm just content running my machines.
My company makes desalination equipment. It takes the salt out of sea water so it can be used for drinking and irrigation. A lot of our customers are in the Middle East. I have to go there whenever new equipment is being set up to make sure it's properly installed and everything is running smoothly.

4.* Speaking practice *Role play

Task 6

Work in pairs, A and B. Each of you has profiles of three workers in a light engineering plant which supplies car electrical components such as starter motor, fuel pumps, and alternators.
Play the part of one these workers and be prepared to answer questions from your partner about your work. Your partner must try to identify your job from your replies.
In turn, find out about your partner.
Do not give your partner your job title until he or she has found out as much information as possible and has made a guess at your occupation. Try to find out:

1. Age
2. Education
3. Qualifications
4. Nature of work
5. Who he/she is responsible to
6. What he/she feels about his/her work

5.* Listening *Inferring from samples

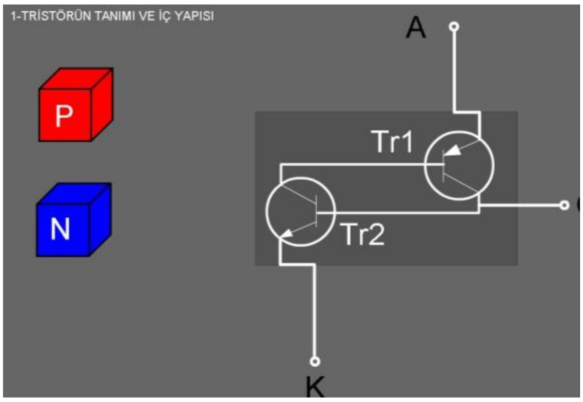
Task 7

Listen to these workers talking about their jobs. Try to match each extract to one of these jobs.

a. Methods engineer
b. Systems analyst
c. Toolmaker
d. Machine tool development fitter
e. Foreman/ woman
f. Applications engineer

6. Exercise 1: Translate into Vietnamese

HOW DOES A THYRISTOR WORK



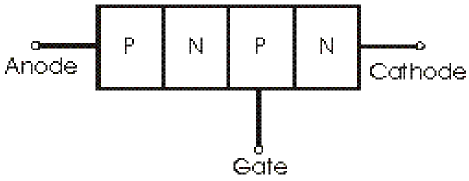
1. What is a thyristor? (Watch Video)

Thyristors or silicon controlled rectifiers (SCR) as they are sometimes known may appear to be unusual electronics components in many ways, but they are particularly useful for controlling power circuits. As such these electronics components are often used for applications such as light dimmers, and there may be thyristor circuits used in many power supply applications. Thyristors are simple to use and cheap to buy and often thyristor circuits are easy to build and use. All these reasons make thyristors ideal components to consider for many applications.

The idea for the thyristor is not new. The idea for the device was first put forward in 1950 by William Shockley, one of the inventors of the transistor. Although some later investigation of the device was undertaken by others a couple of years later, it was not until the early 1960s when they became available. After the introduction of the thyristor, they soon became popular for power supply circuits.

2. Structure of a Thyristor or Silicon Controlled Rectifier (Scr)

The thyristor may be considered a rather an unusual form of electronics component because it consists of four layers of differently doped silicon rather than the three layers of the conventional bipolar transistors. Whereas conventional transistors may have a p-n-p or n-p-n structure with the electrodes named collector, base and emitter, the thyristor has a p-n-p-n structure with the outer layers with their electrodes referred to as the anode (n-type) and the cathode (p-type). The control terminal of the SCR is named the gate and it is connected to the p-type layer that adjoins the cathode layer.

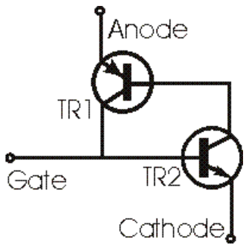


Thyristors are usually manufactured from silicon, although, in theory other types of semiconductor could be used. The first reason for using silicon for thyistors is that silicon is the ideal choice because of its overall properties. It is able to handle the voltage and currents required for high power applications. Additionally it has good thermal properties. The second major reason is that silicon technology is well established and it is widely used for a variety of semiconductor electronics components. As a result it is very cheap and easy for semiconductor manufacturers to use.

3. How does a thyristor work?

The way in which a thyristor operates is different to other devices. Normally no current flows across the device. However if a supply is connected across the device, and a small amount of current is injected into the gate, then the device will "fire" and conduct. It will remain in the conducting state until the supply is removed.

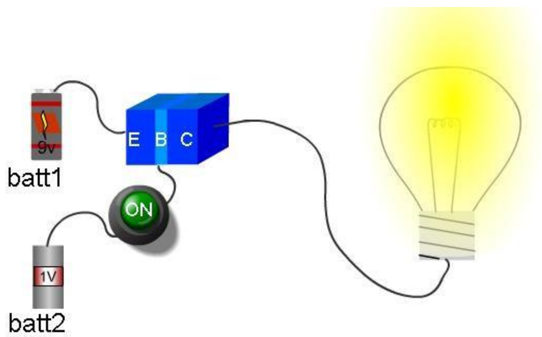
To see how the thyristor operates, it is worth looking at a thyristor equivalent circuit. For the sake of an explanation, the thyristor circuit can be considered as two back to back transistors. The first transistor with its emitter connected to the cathode of the thyristor is an n-p-n device, whereas a second transistor with its emitter connected to the anode of the thyristor, SCR is a p-n-p variety. The gate is connected to the base of the n-p-n transistor as shown below.



4. Thyristor Equivalent Circuit

When a voltage is applied across a thyristor no current flows because neither transistor is conducting. As a result there is no complete path across the device. If a small current is passed through the gate electrode, this will turn "on" the transistor TR2. When this occurs it will cause the collector of TR2 to fall towards the voltage on the emitter, i.e. the cathode of the whole device. When this occurs it will cause current to flow through the base of TR1 and turn this transistor "on". Again this will now try to pull the voltage on the collector of TR1 towards its emitter voltage. This will cause current to flow in the emitter of TR2, causing its "on" state to be maintained. In this way it only requires a small trigger pulse on the gate to turn the thyristor on. Once switched on, the thyristor can only be turned off by removing the supply voltage.

It can be seen that current will only flow in one direction through the thyristor. If a reverse voltage is applied, then no current will flow, even if some gate current is applied. In this way for thyristor circuits used for AC, operation only occurs over one half of the AC waveform. For the other half of the cycle the device remains inoperative and no current can flow.



7. Exercise 2: Listening and Speaking Skill

- Student choose at least 1 from 15 topic in PART 5 to practice listening and speaking skill

PART 5. LISTENING SKILL AND SPEAKING SKILL

1. **Listening skill**
   - **WATCH VIDEO 1** (TRANSFORMER) and write what you have heard.
   - **WATCH ANIMATION 2** (LOGIC GATE) and write what you have heard.
   - **WATCH VIDEO 3** (DC MOTOR) and write what you have heard.
   - **WATCH VIDEO 4** (INDUCTION MOTOR) and write what you have heard.
   - **WATCH ANIMATION 5** (PN JUNCTION DIODE) and write what you have heard.
   - **WATCH ANIMATION 6** (REFRIGERATOR) and write what you have heard.
   - **WATCH ANIMATION 7** (SEMICONDUCTOR) and write what you have heard.
   - **WATCH VIDEO 8** (SINGLE PHASE INDUCTION MOTOR) and write what you have heard.
   - **WATCH VIDEO 9** (TRANSISOR) and write what you have heard.
   - **WATCH VIDEO 10** (INTEGRATED CIRCUIT) and write what you have heard.
   - **WATCH ANIMATION 11** (LOGIC GATE ACT) and write what you have heard.
   - **WATCH ANIMATION 12** (SYMBOL ELECTRIC CIRCUITS) and write what you have heard.
   - **WATCH ANIMATION 13** (COMMON TYPE CIRCUITS) and write what you have heard.
   - **WATCH ANIMATION 14** (ELECTRIC FUSE) and write what you have heard.
   - **WATCH ANIMATION 15** (DC GENERATOR) and write what you have heard.

2. **Speaking skill**
   - **SEE THE ANIMATION 1** (AC GENERATOR) and talk about this topic.
   - **SEE THE ANIMATION 2** (ELECTRIC BELL) and talk about this topic.
   - **SEE THE ANIMATION 3** (SHORT CIRCUIT) and talk about this topic.
   - **SEE THE ANIMATION 4** (OHM LAW) and talk about this topic.
   - **SEE THE ANIMATION 5** (MAGNETIC FIEKD) and talk about this topic.
   - **SEE THE ANIMATION 6** (BIOGAS POWER PLANT) and talk about this topic.
   - **SEE THE ANIMATION 7** (ELECTRIC FLUX) and talk about this topic.
   - **SEE THE ANIMATION 8** (FAX MACHINE) and talk about this topic.
   - **SEE THE ANIMATION 9** (LIGHTNING) and talk about this topic.
   - **SEE THE ANIMATION 10** (HYDRO POWER PLANT) and talk about this topic.
   - **SEE THE ANIMATION 11** (SATTLELITE) and talk about this topic.
   - **SEE THE ANIMATION 12** (AC-DC MACHINE) and talk about this topic.

- **SEE THE ANIMATION 13** (TRANSFORMER) and talk about this topic.
- **SEE THE ANIMATION 14** (CHANGE STATE) and talk about this topic.
- **SEE THE ANIMATION 15** (TRANSISTOR) and talk about this topic.

3. Quiz

– Quiz 1. Transformer quiz
– Quiz 2. Electric motor quiz
– Quiz 3. Electric motor quiz

PART 6. REVIEW

1. Review

Describing function
Using the Present simple: The function of X is to...
What does an electric motor do?
• An electric motor converts electrical energy to mechanical energy. • ROM holds instructions which are needed to start up the computer
We can emphasize the function like this:
• The function of an electric motor is to convert electrical energy to mechanical energy. • The function of ROM is to hold instructions which are needed to start up the computer.
Used to-infinitive, Used for + -ing form
• ROM is used to hold instructions which are needed to start the computer. • ROM is used for holding instructions which are needed to start up the computer.
Describing structure
A X consists of a Y and a Z. ....is made up of ....is composed of....
• A simple dc motor consists of a field magnet and an armature.
• A transformer consists of two coils, a primary and a secondary.
• The core is made up of thin pieces of soft iron.
• The coil number is composed of loops of wire. • The armature is made up of a loop of wire and a split ring known as a commutator.
Name components
known as
called
• Carbon blocks called brushes.
• The armature is made up of a loop of wire and a split ring known as a commutator.
Locate components

- The armature is placed between the poles.

Connect components

- The loop is connected to the commutator.
- Current is supplied to the motor through carbon blocks called brushes.

Describe how components are connected to each other

- A is bolted to B. = A is connected to B with bolts.
- A is welded to B. = A is connected to B by welding.
- A is fixed to B. = no specific method given.
- screwed
- soldered
- attached
- wired
- bonded
- glued
- riveted
- welded
- brazed
- nailed

Principles and laws

If/When (action – present tense), (result- present tense).

- If a liquid is heated, it changes to a gas or vapour.
- If a gas is allowed to expand, it cools down.
- If a gas is compressed, it heats up.

Verbs and related nouns: er or or

Refrigerate	refrigerator
a. condense	condenser
b.evaporate	evaporator
c. compress	compressor
d. resist	resister
e.charge	charger
f. generate	generator
g.conduct	conductor
h. exchange	exchanger

i. radiate	radiator
j. control	controller
Verbs with –ize/-ise	
• The rotor is magnetized. • The rotor is made magnetic.	
What do these abbreviations mean?	
• MCC: motor control center. • PT: potential transformer. • CT: current transformer.	

2. Answer questions

1. Why do you like technical English?
2. How often do you practise technical English?
3. Do you think technical English is important to you?
4. How can you improve your technical English?
5. Why do you think technical English is difficult to learn?